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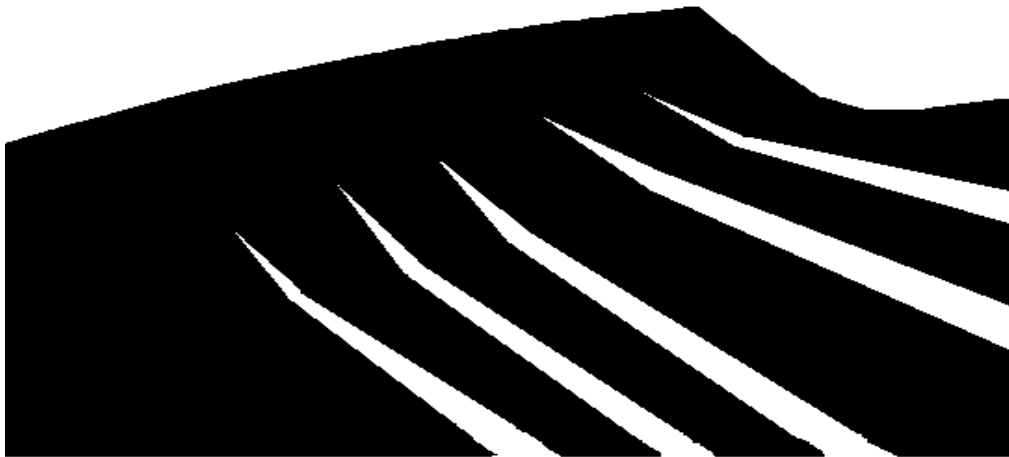
March 21, 1997

LANL-EES-DP-115, R4

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VAISALA HMI-36 HUMIDITY PROBE PROCEDURE

LOS ALAMOS QUALITY PROGRAM



APPROVAL FOR RELEASE

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Los Alamos

Yucca Mountain Site

Characterization Project

HISTORY OF REVISION

REVISION NO.	EFFECTIVE DATE	PAGES REVISED	REASON FOR CHANGE
R0		N/A	Initial procedure.
R1		N/A	History of revisions not in place.
R2	07/11/91	3 & 4	Change of responsibilities, and sections added for the detection of malfunctions, safety considerations, and preparatory verification - hold points. Revision 1 of this procedure was previously identified as TWS-ESS-DP-115.
R3	011/11/94	All	To reflect an upgrade from HMI-32 to HMI-36 probes and to address the current methods of operation and calibration.
R4	03/21/97	All	Revised to comply with LANL-YMP-QP-06.3 requirements.

Los AlamosYucca Mountain Site
Characterization Project

VAISALA HUMIDITY PROBE PROCEDURE

1.0 PURPOSE

The purpose of this procedure is to describe the methods, procedures, and documentation required when operating or calibrating the Vaisala HMI-36 controller fitted with HMP-35b humidity probes.

2.0 SCOPE

This procedure applies to humidity measurements conducted for the Yucca Mountain Site Characterization Project (YMP).

3.0 REFERENCES

Operating Manual for HMI-36 Humidity and Temperature Indicator, edition HMI36-00259-2.2, copyright 1992, Vaisala Instrument Company, Helsinki, Finland.
Operating Manual for HMP 35B Humidity and Temperature Probes, edition HMP35B-00260-1.1, copyright 1990, Vaisala Instrument Company, Helsinki, Finland.
LANL-YMP-QP-02.7, Personnel Training
LANL-YMP-QP-03.5, Documenting Scientific Investigations
LANL-YMP-QP-12.3, Control of Measuring and Test Equipment and Standards
LANL-YMP-QP-17.6, Records Management
LANL-YMP-DP-105, Thermal Calibration Procedure

4.0 DEFINITIONS

YMP: Yucca Mountain Site Characterization Project

5.0 RESPONSIBILITIES

The following personnel are responsible for the activities identified in Section 6.0 of this procedure:

- The Principal Investigator (PI)
- Users of this Procedure

6.0 PROCEDURE

The use of this procedure must be controlled as follows:

- If this procedure cannot be implemented as written, YMP personnel should notify appropriate supervision. If it is determined that a portion of the work cannot be accomplished as described in this DP, or would result in an undesirable situation, that portion of the work will be stopped and not resumed until this procedure is modified, replaced by a new document, or the current work practice is documented in accordance with QP-03.5, Section 6.1.6.

- Employees may use copies of this procedure printed from the controlled document electronic file; however, employees are responsible for assuring that the correct revision of this procedure is used.
- When this procedure becomes obsolete or superseded, it must be destroyed or marked “superseded” to ensure that this document is not used to perform work.

6.1 Principle

Relative humidity has an effect on certain hydrous minerals such as clays and zeolites. When conducting experiments using these minerals, it is desirable to know the humidity under which the experiments were conducted.

6.2 Equipment and Hardware/Software

The only equipment used is the Vaisala HMI-36 data processor fitted with HMP-35B probes. Although the HMI-36 data processor can be controlled through a computer interface, computer control is not required to operate the humidity probe. Any software written for computer control shall be developed under the appropriate LANL YMP procedure governing software development.

6.2.1 Equipment Malfunction

Malfunctions are readily apparent. The humidity probe should either work or not work.

6.2.2 Safety Considerations

None.

6.2.3 Special Handling

6.2.3.1 NEVER touch the sensor!

6.2.3.2 Remove any soot, dust, or other solids deposited on the sensor by blowing gently (do not use compressed air).

6.2.3.3 Care should be used during calibration to ensure that the probe tip does not come in contact with the salt solution or remain in the vapor for extended periods of time or the probe tip could become damaged.

6.3 Preparatory Verification

6.3.1 Hold Points

None.

6.3.2 Calibration

Calibration of the Vaisala HMI-36 humidity controller fitted with the HMP35B probes shall be conducted annually in accordance with section 6.5.2 of this procedure. Only personnel trained to this procedure shall be allowed to perform YMP-related calibration on the equipment covered by this procedure.

6.3.3 Environmental Conditions

None.

6.4 Control of Samples

N/A.

6.5 Implementing Procedure

6.5.1 Instrument Operation

The instrument is set up and operated following the instructions in the operating manuals.

6.5.2 Instrument Calibration

Calibrations of the Vaisala HMI-36 and its probes are conducted in accordance with QP-12.3.

Temperature calibration shall be conducted in accordance with DP-105 where the output temperature from the humidity probe is compared with that from a calibrated digital thermometer.

Humidity calibration shall be conducted by placing the humidity probe into an environment with a known relative humidity and comparing the known value with the indicated value. Since NIST standards do not exist for relative humidity, known physical constants should be used for calibration points. For example, saturated salt solutions (e.g., LiCl and NaCl) can be used in conjunction with the Vaisala Humidity Meter Calibrator HMK-11 as outlined in the operating manual.

NOTE: When calibrating the probe, seal off the calibration port with the probe inserted using parafilm. Care should be used during calibration to ensure that the probe tip does not come in contact with the salt solution or remain in the vapor for extended periods of time or the probe tip could become damaged.

Likewise, other environments such as a cell that is saturated with water vapor and is cooled slightly to form a condensing environment can be used for a 100% RH data point and the boil-off gas from liquid nitrogen can be used as a 0% RH data point.

6.6 Data Acquisition and Reduction

Data acquisition and reduction shall be controlled by each analyst in their YMP notebook if and when data are obtained with the humidity probe.

6.7 Potential Sources of Error and Uncertainty

There are no known sources of error other than physical damage to the probe itself.

7.0 Records

Records generated as a result of this DP are entries in laboratory notebooks or attachments to laboratory notebooks. The documentation should consist of any applicable items identified in Section 6.0 of this procedure. Laboratory notebooks should be kept in accordance with QP-03.5.

All records should be submitted to the Records Processing Center in accordance with QP-17.6.

8.0 ACCEPTANCE CRITERIA

- 8.1 A properly calibrated probe should produce accurate measurements. If the measurements are questionable, a calibration check is suggested.
- 8.2 There are no known sources of error other than physical damage to the probe itself.
- 8.3 A logbook/notebook entry for a measurement shall constitute evidence that the procedure has been implemented and satisfactorily accomplished.

9.0 TRAINING REQUIREMENTS

- 9.1 Prior to conducting work described in Section 6.0, the user requires training to this procedure.
- 9.2 Training to this procedure is accomplished by "read only." Training will be documented per QP-02.7.

10.0 ATTACHMENTS

None.